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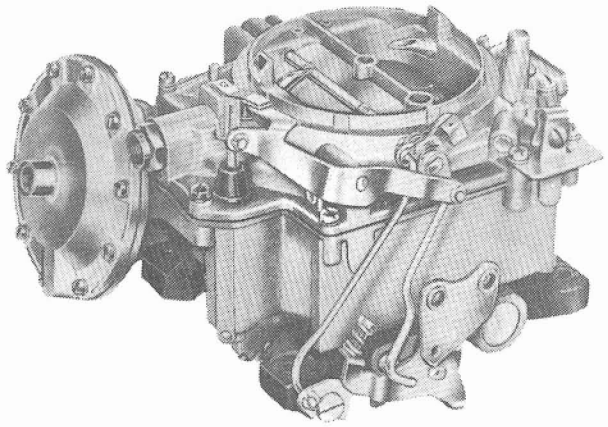
MODELS 4G, 4GC SERVICE MANUAL

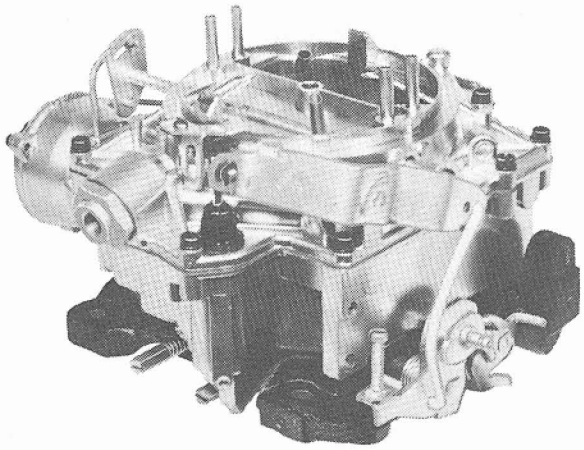
Delco Rochester

PRICE 25 cents

Delco Rochester



MODEL 4G
(VACUUM GOVERNOR)



MODEL 4GC

GENERAL DESCRIPTION

The Model 4G and 4GC carburetors are a 4-bore downdraft type which provide the advantages of two 2-bore carburetors in one unit. The Model 4G carburetor has a manually operated choke while the Model 4GC has a completely automatic choke. Some Model 4G carburetors are equipped with a vacuum controlled governor to control engine speed (R.P.M.) on heavy duty truck applications.

The 4-bore Rochester carburetor has a concentric float bowl which allows the fuel in the float bowl to completely surround the bore and venturi. This has advantages because the correct fuel level can be maintained for efficient metering during cornering or up and down hill operation of the vehicle.

The Rochester air bled main well system is used with a removable venturi cluster. The venturi cluster contains the main metering parts of the carburetor and can easily be removed for cleaning and inspection. The cluster is insulated from the float bowl by a mounting gasket. The main well and idle tubes are suspended in the fuel in the main fuel well. Both the above tend to insulate the main metering parts from engine heat. This insulation helps prevent fuel vapors caused by engine heat from disrupting carburetor metering.

To aid in description and the proper identification of parts, the carburetor is divided into a *primary* and *secondary* side.

The *primary side* covers the forward half of the carburetor assembly. This section is essentially a complete 2-bore carburetor containing a float system, adjustable idle system, main metering system, pump system, power system and choke system.

The *secondary side* is a supplementary 2-bore carburetor which feeds extra air and fuel to the engine when needed for power requirements. This section contains a float system, main metering system and, on some applications, a fixed idle system. It has a set of throttle valves and separate auxiliary valves which are located in the bores above the throttle valves.

The primary throttle valves are operated by the accelerator pedal which is connected by linkage to the primary throttle lever. The secondary throttle valves are operated by linkage which is connected to another lever on the primary throttle shaft. The secondary throttle linkage is designed so that the secondary valves do not begin to open until sufficient air velocity can be maintained through the carburetor for good metering. Although the secondary valves do not begin to open until after the primary throttle valves are partially open, they both reach the wide open position at the same time. This is accomplished by lever ratios between the primary and secondary throttle levers.

OPERATING SYSTEMS

There are six basic operating systems used in the Model 4G and 4GC carburetors. They are float, idle, main metering, power, pump and choke systems. The following text covers each system separately to provide a thorough understanding of the system for ease in trouble-shooting.

Float Systems (Fig. 1)(Fig.2)(Fig. 3)

Each side of the carburetor has a separate and independent float system, consisting of a float chamber formed by a partition in the float bowl, a dual pontoon float, a float needle valve and valve seat.

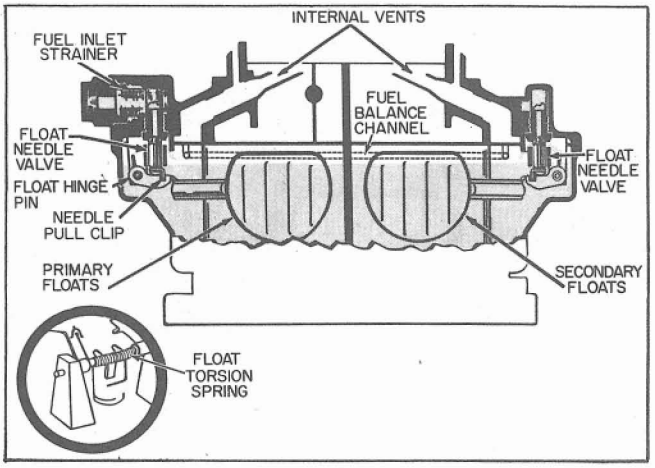


FIGURE 1

Fuel enters the carburetor through the fuel inlet in the primary side of the air horn. From this point fuel flows to the separate float chambers through a horizontal passage in the air horn. When the fuel reaches the prescribed level in each float chamber, the float moves the needle valve against its seat to shut off the flow of fuel.

There is a fuel balance channel located in the side of the float bowl above normal fuel level which connects the fuel chambers on the primary and secondary sides. In this way, any abnormal rise in fuel level in one side of the carburetor bowl will automatically balance with the other side.

Both high and low float bowl designs are used in the Rochester 4-bore carburetors. The type used is dependent upon engine demands and underhood clearance. Both round and "D" shaped float pontoons are used in the high float bowl. A smaller wedge shaped float is used in the low bowl design.

Float assist springs are used on some high bowl and all low bowl applications. Their purpose is to assist the floats in holding the float needle valve closed, especially where fuel pressures are encountered.

The following types of float assemblies and assist springs are used.

A. Figure 1 (see inset) A torsion spring wrapped around the float hinge pin with one end fastened to the float arm and the other end resting on the needle seat. This design is normally used with the high float bowl and the "D" shaped float.

B. Figure 2. A float balance spring is installed between the float hanger posts to apply pressure on the float tang at the rear of the float arm. The spring tension against the tang determines the float drop and will affect fuel level. With this type assist spring float drop setting is very critical.

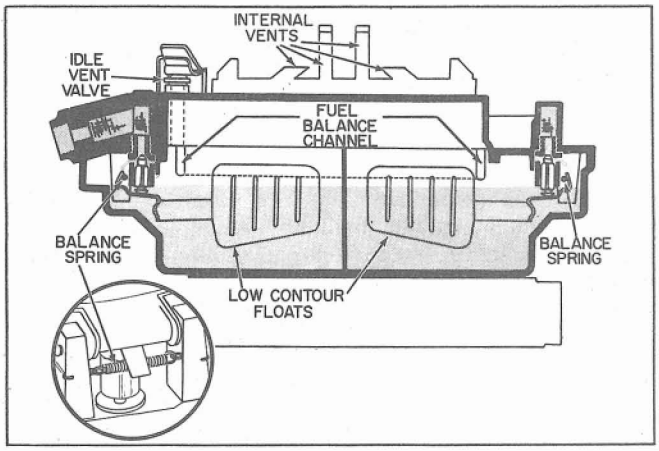


FIGURE 2

C. Figure 3. A coiled spring located on the power piston stem exerts pressure on a tang on the float arm, whenever the power piston is in the up position. During heavy acceleration or power system operation, the power piston drops and releases all pressure applied to the tang. This allows maximum float drop under heavy fuel demands and assists in closing the needle under normal operation. With this system, a vacuum assist spring adjustment is necessary.

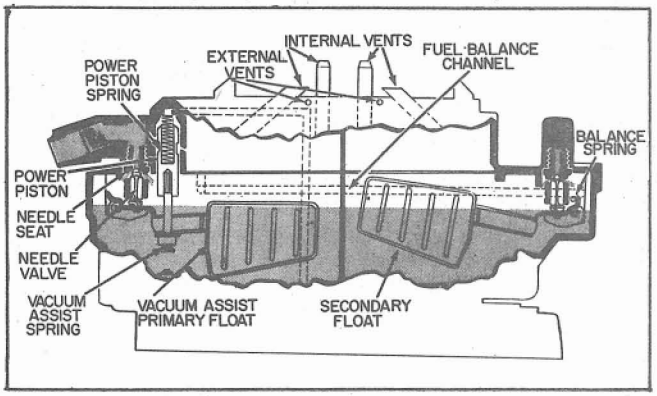


FIGURE 3

Both sides of the carburetor are individually and internally vented by the tubes as shown in Figure 3. These vents transmit the air pressure from beneath the air cleaner to the fuel in the float bowl. The amount of fuel metered by the carburetor depends upon the pressure in the bowl.

Some applications have external vent holes drilled in the upper part of the air horn. These fixed external vents allow any fuel vapors which may form in the fuel bowl to be vented to the outside. This helps idle and hard starting during periods of hot operation.

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Float System — Cont.

Some applications use an atmospheric idle vent valve. This vent valve is located on the air horn just above the float bowl (See Fig. 2). It is operated by the tang on the pump lever. When the throttle lever is in the idle position, the idle vent valve is open to allow any fuel vapor pressure built up in the float bowl during periods of hot engine idle and hot soak, to escape to the outside. The vent valve closes when the throttle valves are opened, returning the carburetor to internal balance by venting the fuel bowl through the internal vents inside the air horn.

Idle System (Fig. 4)

At small throttle openings the vacuum created by the main venturi is not sufficient to cause fuel to flow from the nozzles. Therefore, an additional system has been provided to furnish the proper mixture ratios required throughout the low speed range.

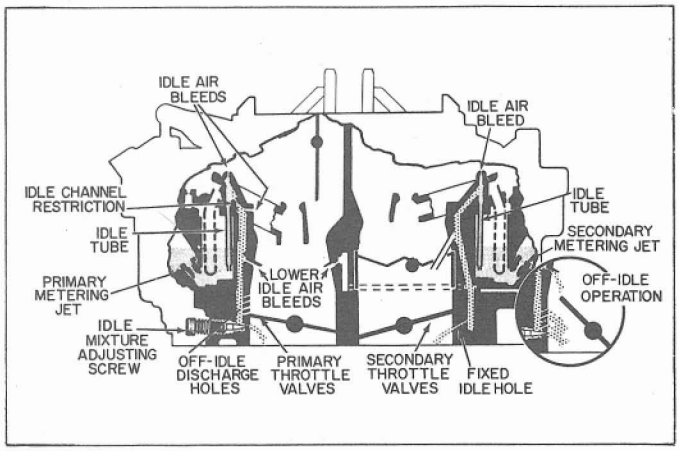

FIGURE 4

An adjustable idle system is used in the primary side of the carburetor which supplies the fuel required for normal curb idle, as well as that required for operation in the off idle and low speed range. The idle fuel passes from the float bowl through the main metering jets into the main well area. The fuel then travels up the idle tube, past an air bleed, through the idle restriction, and past another air bleed. The mixture then travels down through a passage in the bowl, past the lower idle air bleed, (where used) and then past the off idle ports where additional air is bled into the mixture. The mixture is then discharged into the throttle bores from the idle needle holes.

Some applications have a fixed idle system on the secondary side. The quantity of air/fuel mixture is controlled by the size of the discharge hole located below the throttle valves on the secondary side.

Off-idle operation: (See Inset)

As the throttle valves are opened from the curb idle position, the air entering the off-idle discharge holes gradually diminishes. When these holes become exposed to manifold vacuum, they then become fuel discharge holes.

Further opening of the throttle valves increases the air velocity through the carburetor sufficiently to cause the air to strike the end of the extended lower idle air bleeds, thus creating a low pressure within the bleed tube. As a result, fuel begins to discharge from the lower idle air bleed tubes and continues to do so through the part throttle and wide open throttle ranges supplementing the main discharge nozzle delivery.

Idle Air By-Pass System (Fig. 5)

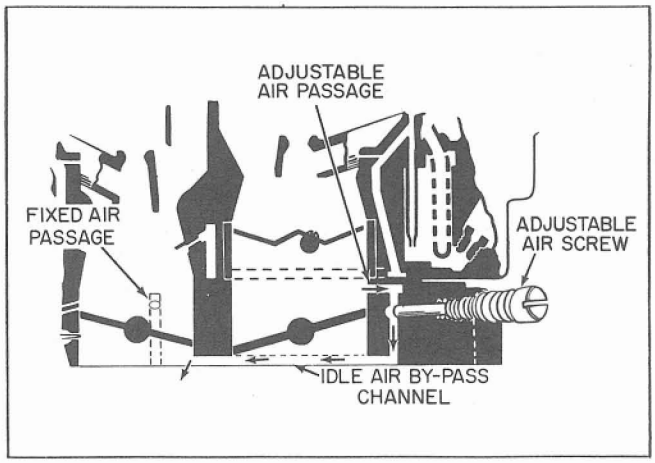

FIGURE 5

Some Model 4GC carburetors use an idle air by-pass system. The purpose of this system is to allow the primary throttle valves to be completely closed during curb idle operation. This design prevents carbon and gum formations which may form around the throttle valves from disrupting engine idle speed.

The fuel flow in this system is basically the same as in the standard idle system described previously. However, the idle air which normally passes by the slightly open throttle valve is passed around the throttle valves through an idle air by-pass channel.

In this system, idle air is taken from the carburetor bore above the throttle valves, by-passes around the closed throttle valves, through an air channel and enters the carburetor bore just below the throttle valves. The amount of idle air which is supplied to the engine is regulated by an idle air adjustment screw located in the idle air passage. The adjustment screw is located on most models at the left rear of the carburetor as mounted on the engine. Turning the screw inward (clockwise) lowers the engine idle speed and turning it outward (counter-clockwise) increases the engine speed.

In order to obtain sufficient idle air for stable idle speed adjustment, a supplementary or fixed idle air bleed is used in addition to the adjustable idle air screw. The fixed air bleed can either be a calibrated hole drilled through each primary throttle valve or a calibrated fixed idle air channel which leads from above the primary throttle valve to below the valve. The type used is dependent upon which is acceptable to the particular engine design.

Idle Air By-Pass — Cont.

When adjusting engine idle speed with the idle air by-pass system, use the following procedure:

1. Start and warm up the engine thoroughly. Make sure choke is completely open and both throttle valves are completely closed.
2. Connect a tachometer to the engine and turn the idle air by-pass screw in or out until the specified idle RPM is reached.
3. Adjust the two idle mixture screws to obtain the highest RPM and a smooth idle.
4. Recheck and reset idle RPM with adjustable air screw, if necessary.
5. If after setting the mixture screws the idle RPM changed and it was necessary to readjust the air screw, recheck the idle mixture adjustment.

The idle mixture must always be rechecked after changing the idle air screw position, otherwise poor off-idle operation will result.

Idle Compensator (Fig. 6)

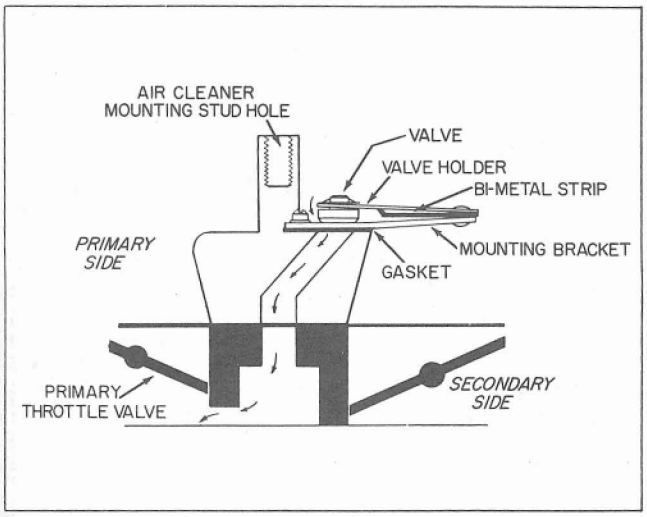

FIGURE 6

Shown in Fig. 6 is an idle compensator valve which is used on some standard and air conditioned models. A thermostatic valve mounted on the secondary side of the float bowl between the secondary venturi, allows additional air to enter the primary bores under extreme "hot idle" conditions.

This valve, called the "idle compensator" is operated by a bi-metal strip which senses temperature. During prolonged hot engine idle the bi-metal strip bends raising the valve which uncovers a hole leading to the underside of the primary throttle valves. The additional air drawn into the engine in this manner is sufficient to offset the enrichening effects of fuel vapors caused by high temperatures and prevents engine stalling. When underhood temperatures are lowered, the valve closes and operation returns to normal. This valve cannot be repaired; a defective valve must be replaced. *Caution: Always make sure valve is closed when adjusting initial idle speed and mixture.*

Main Metering System (Fig. 7)

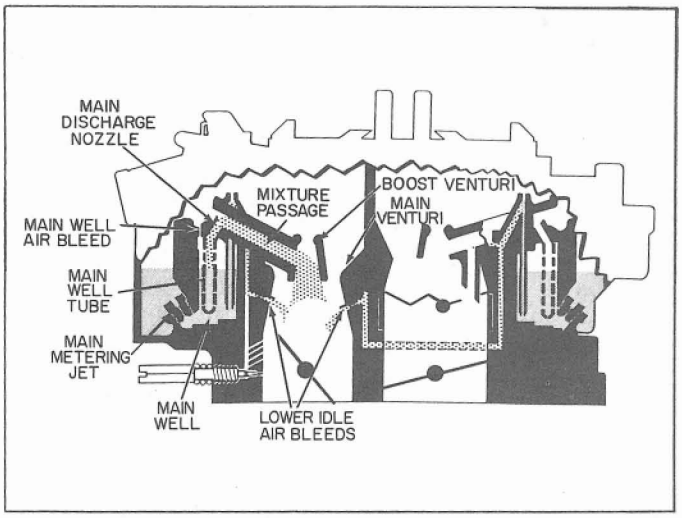

FIGURE 7

The main metering system located in the primary side of the carburetor controls fuel flow between the low speed (idle) and power ranges. Its purpose is to provide efficient fuel metering during the cruising range of the automobile. Its operation is dependent upon air flow through the carburetor venturi which, in turn, creates a low pressure in the venturi, causing fuel to flow in the following manner.

At a point of sufficient throttle opening, the low pressure around the main *venturi* is multiplied many times in the boost venturi. This low pressure is transmitted to the tip of the main well tube or main discharge nozzle. Atmospheric pressure, which is greater, forces fuel from the float bowl through the main metering jets and into the main well. As fuel passes through the main well tubes, it is mixed with air from the main well air bleeds. The fuel mixture then passes from the tip of the discharge nozzle through the mixture passage to the boost venturi, and on into the intake manifold.

As the throttle opening is increased and more fuel is drawn through the main well tubes, the fuel in the main well drops. The calibrated holes in the main tubes are proportionately exposed to the air in the upper well area. When this occurs, they become air bleeds mixing progressively more air with the fuel passing through the main well tubes. Although the nozzle suction is increased by increasing the throttle opening, the air/fuel mixture to the engine remains constant throughout the part throttle range. The calibrated main metering jet orifices plus the main well air bleeds provide the correct air/fuel mixture ratios for efficient combustion during the part throttle and cruising ranges.

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Power System (Fig. 8)

To obtain the proper mixtures required for maximum engine power under heavy loads a vacuum operated power system is used.

The power system is located in the primary side of the carburetor. A vacuum channel from the top of the power piston is exposed to manifold vacuum beneath the throttle valves. The vacuum in this channel varies directly with manifold vacuum which is normally high in the idle and main metering ranges. The vacuum is sufficient to hold the power piston in the up position against the force of a calibrated spring. However, as the throttle valves are opened, the vacuum drops.

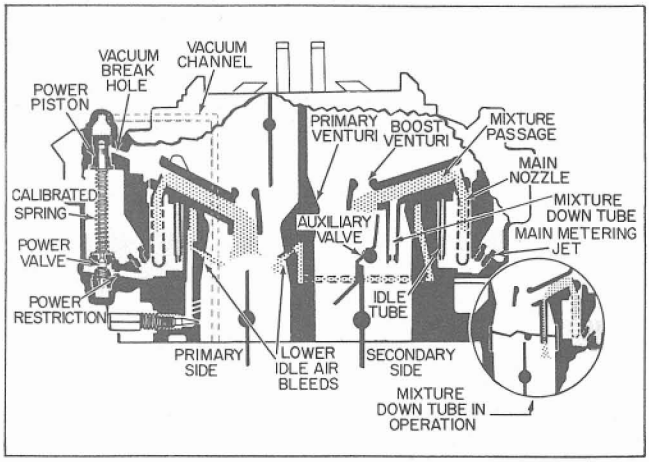

FIGURE 8

When the manifold vacuum drops below approximately 9" mercury the calibrated power piston spring forces the piston down. When the piston drops down, it unseats the spring loaded power valve. This permits additional fuel to flow from the float bowl through the calibrated power restrictions and into the main well.

The additional fuel supplements that already flowing through the main metering jets (on the primary side) providing a richer mixture for power demands. This power mixture continues to be supplied as long as the manifold vacuum remains below approximately 9" mercury. When the manifold vacuum again increases sufficiently, the force of the power piston spring is overcome and the piston is drawn up, returning the carburetor to normal mixtures.

The power piston cavity in the carburetor air horn is connected to the air horn bore by a vacuum break hole. The purpose of this hole is to prevent the transfer of vacuum acting on the power piston from also acting on the top of the fuel in the float bowl. Any additional vacuum acting on the fuel in the float bowl would affect carburetor calibration.

It is also in this range that the secondary side of the carburetor provides additional air and fuel to the engine for increased power. For high speed or power operation, the throttle linkage engages the secondary throttle valves and opens them completely in the remaining few degrees of primary throttle travel. In this range, manifold vacuum acting on the secondary side of the carburetor is multiplied at the main and boost venturi and draws fuel from the float bowl through the calibrated main metering jets into the main wells. The fuel then passes through the main well tubes and is bled in a manner similar to that described previously in the operation of the primary main well air bleeds. It is then drawn to the tips of the main well tubes (nozzles) and passes through the mixture passage to the boost venturi and is discharged into the intake manifold. The lower idle air bleeds (where used) also supply fuel throughout the power range in a manner similar to that described under the main metering system operation.

The auxiliary valves (Figs. 8) provide a means for controlling secondary bore openings according to air velocity at wide open throttle. During the period in which the secondary throttle valves are opened and air flow is not high enough in the secondary bores to open the auxiliary valves, additional fuel is needed for the air which by-passes around the auxiliary valves. This additional fuel is supplied by down tubes (see inset) (Fig. 8) which extend from the mixture channel in the venturi cluster arm or bowl, to the low pressure point below the closed auxiliary valves.

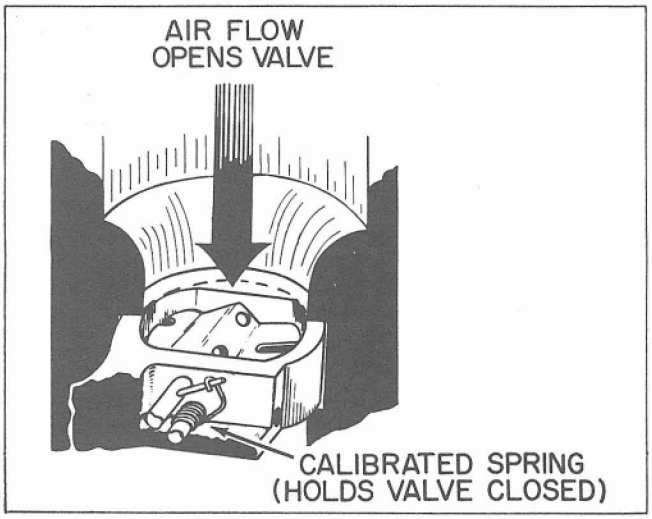

FIGURE 9

When the air flow is high enough to open the auxiliary valves, the down tubes no longer feed fuel as the low pressure point is now in the boost venturi. With this feature, the correct air/fuel mixture can be supplied at any point during secondary throttle valve operation.

The auxiliary valves (Fig. 9) are normally held closed by a calibrated spring. The tension of the spring is set so that the valves will open, only when the engine demands more air and fuel for power operation.

The auxiliary valves are factory calibrated and cannot be adjusted in the field.

Pump System (Fig. 10)

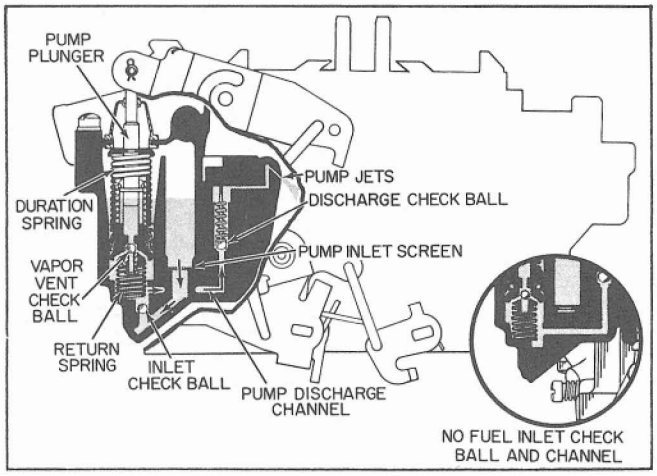

FIGURE 10

When the throttle is opened rapidly the air flow increases almost instantaneously, while the heavier fuel tends to lag behind, causing a momentary leanness. The accelerator pump provides the fuel necessary for smooth operation during acceleration. It will be noted that since the throttle valves on the secondary side of the carburetor remain fully closed throughout part throttle operation, it is only necessary to have one accelerator pump which is located on the primary side of the carburetor.

A double spring pump plunger is used. The rates of compression of the top spring and the bottom spring are calibrated to insure a smooth sustained charge of fuel for acceleration. The accelerator pump is connected through the pump shaft and lever assembly, and the pump rod to the throttle lever. On the pump intake or up stroke of the plunger, fuel from the float bowl passes through the pump filter screen. It unseats an aluminum inlet check ball and fills the pump well. Upon acceleration or down stroke of the pump plunger, the force of fuel in the pump well seats the inlet ball. The fuel is then forced through the discharge channel, to unseat the pump discharge ball, and then discharges through the pump jets into the air stream. At the end of the discharge, the discharge ball is returned to its seat by a calibrated spring, which prevents air being drawn back into the fuel channel during the intake stroke.

The pump plunger head is vented to minimize the effect of fuel percolation in the pump well. This has been accomplished by the design of a check ball and seat in the plunger head. In this manner, any fuel vapors in the pump well will rise and by-pass the ball, venting themselves into the float bowl. There is always a charge of solid fuel beneath the plunger head for rapid acceleration. Without this feature, any vapor pressure build up would evacuate the charge of fuel in the pump system, causing poor initial acceleration as well as difficult hot starting.

(See Inset)

Some models do not have inlet check balls. On these applications, the fuel enters through a slot in the side of the pump well. On the up stroke of the plunger, fuel will pass through the vapor vent ball passage and between the plunger and pump well wall. This will fill the pump well below the plunger with fresh fuel.

The carburetor also makes use of a pump plunger boot which serves the dual purpose of preventing dirt and foreign material from entering the fuel bowl through the shaft opening on top of the air horn and also provides the proper seal necessary to maintain the correct air pressure within the fuel bowl.

Choke System

The 4GC models use an automatic choke while the 4G models use a manual choke.

There are three designs of automatic choke systems used on the 4GC models. We will refer to them as the *conventional system*, the *split linkage system* and the *hot water system*.

Conventional System (Fig. 11)

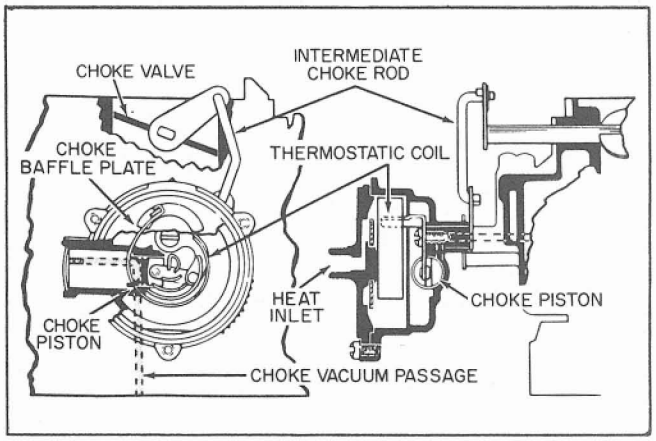

FIGURE 11

The conventional choke system may have the choke housing assembly mounted on the air horn, float bowl, or throttle body. On units with the housing on the bowl or throttle body, an intermediate choke rod adjustment is necessary. The principles of operation are the same on all units.

Choking of the carburetor is necessary only on the primary side as the secondary throttle valves are locked in the closed position whenever the choke valve is partially closed. This is accomplished by a secondary throttle shaft lock out lever and a slot in the fast idle cam. Whenever the choke valve is closed, the lock out lever prevents opening of the secondary throttle valves. When the choke valve is wide open, the fast idle cam drops down so that the lock out lever clears the cam, permitting the secondary throttle valves to open.

The choke system consists of a thermostatic coil assembly, choke piston, off set choke valve and fast idle cam and linkage. Its operation is controlled by a combination of intake manifold vacuum, the off set choke valve and temperature.

When the engine is cold, the thermostatic coil is

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Choke System — *(Cont.)*

calibrated to hold the choke valve closed. As the engine is started, air velocity against the off set choke valve causes it to open slightly against the torque of the thermostatic coil. In addition, intake manifold is applied to the choke piston through a vacuum passage which also tends to open the choke valve. The choke valve assumes a position where the torque of the thermostatic coil is balanced against vacuum pull on the choke piston and air velocity against the off set choke valve. This results in a regulated air flow into the carburetor which provides a richer mixture during the warm-up period.

During the warm-up period the vacuum piston serves to modify the choke action to compensate for varying engine loads or acceleration. Any acceleration or increased load decreases the vacuum pull on the choke piston. This allows the thermostatic coil to momentarily increase choke valve closure to provide the engine with a richer mixture for acceleration.

As the engine warms up, hot air from a tube heated by exhaust gas is drawn into the thermostatic coil housing. The hot air causes the coil to slowly relax its tension. Thus the choke valve is allowed to move gradually to the full open position.

To prevent stalling during the warm-up period, it is necessary to run the engine at a slightly higher idle speed than for a warm engine. This is accomplished by the fast idle screw which rests on the steps of the fast idle cam. The fast idle cam is linked to the choke valve shaft by the choke rod, choke trip lever and choke lever and collar assembly. This holds the throttle valves open sufficiently during the warm up period to increase the idle RPM until the choke valve moves to the full open position.

When the automatic choke is in operation the driver may wish to advance the throttle to the full wide open position. Since this would decrease the pull upon the choke piston thereby closing the choke valve, it is necessary to provide increased carburetor air flow by opening the choke valve mechanically. To accomplish this, a tang on the fast idle cam is made to contact the throttle lever at wide open throttle position to sufficiently open the choke valve. This is called a choke unloader and also serves to de-choke a flooded engine during starting, whenever the engine is started with the accelerator held fully depressed.

Split Linkage Choke (Fig. 12)

The split linkage choke is designed to let the choke valve and fast idle cam work independently. The operation of the coil and piston is the same as the conventional system. The split linkage operates in the following manner.

The intermediate choke rod is attached to a hole in the end of the intermediate choke lever, while the choke rod is attached to a hole half-way out on the lever. The hole for the intermediate choke rod is at a greater distance from the pivot point than the choke rod. The result is, that as the thermostatic coil warms up and allows the weight of the intermediate choke lever to rotate the lever clockwise,

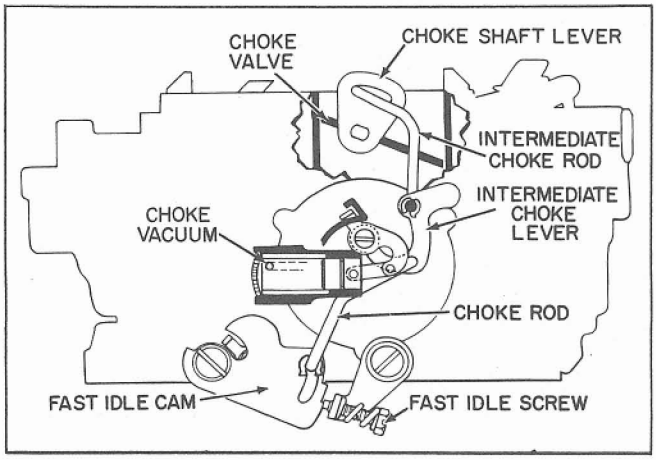

FIGURE 12

the intermediate choke rod will drop faster than the choke rod and allow the choke valve to open while still maintaining a fast idle. With this design, it provides a relatively short choking period with adequate fast idle for a cold engine.

Hot Water System (Fig. 13)

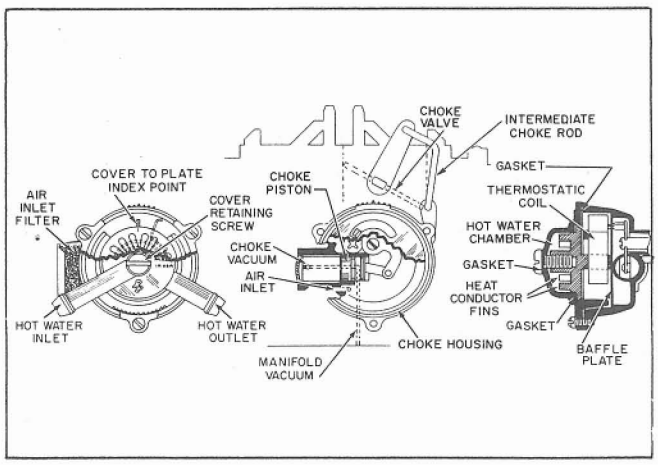

FIGURE 13

Instead of using hot air from the exhaust manifold to heat the thermostatic coil, heat from the engine hot water is used. The engine water is circulated directly from the engine to a chamber in the choke cover. The hot water choke has an inner and outer cover. The inner cover retains the choke coil and the outer cover provides the chamber through which the hot water is circulated. Pick up fingers on the aluminum inner cover extend into the outer cover hot water chamber and pick up heat from the water. The heat is then transmitted through the inner aluminum cover and around the thermostatic coil. The choke housing inside baffle plate is made of an insulating material to hold the heat around the stat coil, which will gradually relax the tension on the coil and allow the choke valve to open. A conventional choke piston is used to control the vacuum break and to assist in opening the choke valve as the coil releases its ten-

sion. Air flow needed to allow vacuum to operate the choke piston enters the choke housing through an opening at the side of the housing which is covered with a filter. The piston and housing are designed so that when the choke valve is in the wide open position, the choke piston blocks off the vacuum passage in the housing. This allows very little air flow through the inner housing when the choke is open. The constant movement of hot water through the outer chamber maintains necessary heat to the choke coil to keep it relaxed and the choke valve wide open. The filter covering the air inlet opening at the side of the choke housing does require periodic cleaning for proper operation.

MODEL 4G TRUCK
VACUUM CONTROLLED GOVERNOR

Operation (Fig. 14)(Fig. 15)

The purpose of the Model 4G truck governor carburetor is to prevent excessive engine speed under light loads by partially closing the throttle valves, but yet allow the throttle valves to be wide open when full power is required. The governor gives full advantage of engine horsepower without danger of excessive engine wear due to overspeeding.

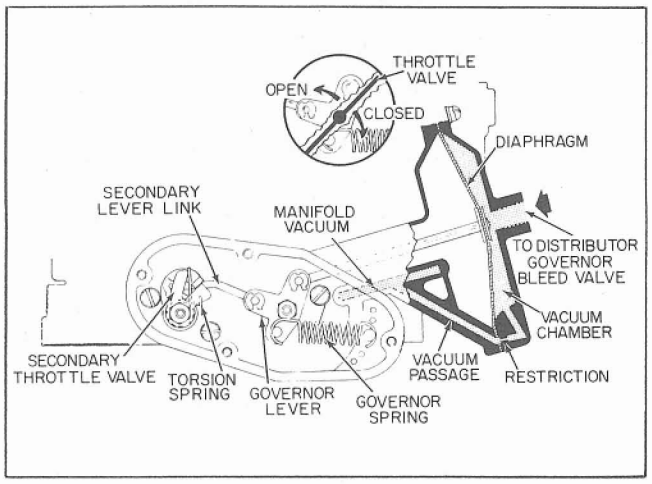

FIGURE 14

The governor consists of two basic units.

Fig. 14. A vacuum diaphragm and connecting linkage mounted on the carburetor throttle body.

Fig. 15. A centrifugal controlled vacuum bleed valve in the ignition distributor.

Both the above units are connected together by a vacuum line (Figs. 14 and 15). Fig. 14 — Vacuum applied to the vacuum diaphragm mounted in a housing on the carburetor throttle body closes the primary and secondary throttle valves through connecting linkage. A governor spring located in the governor housing opens the throttle valves and works against the vacuum diaphragm.

The throttle lever on the opposite end of the throttle shaft is not connected directly to the primary throttle shaft. When the accelerator pedal is depressed, the throttle lever moves and allows the primary throttle valves to open. This is accomplished by the governor spring which holds a tang on the opposite end of the throttle shaft against the throttle lever. Therefore, the primary throttles actually follow the rotation of the throttle lever by the governor spring tension rather than being directly forced open, as on the conventional carburetor.

The centrifugal bleed valve in the distributor (Fig. 15) is nothing more than a sliding valve which is normally held open by spring tension at low engine RPM. It closes at high engine RPM as centrifugal force of the counterweight on the end of the valve shaft moves the valve outward and covers a bleed hole.

In operation, manifold vacuum is supplied to the top side of the governor diaphragm through a passage in the housing which leads to manifold vacuum directly beneath the throttle valves. Calibrated restrictions are used in this passage to control the amount of vacuum applied to the diaphragm.

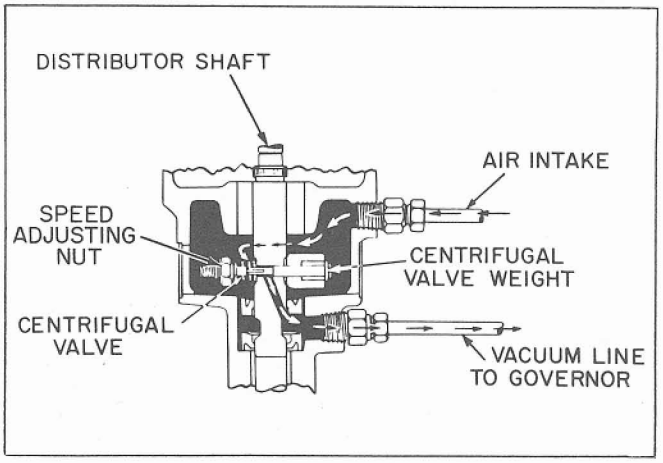

FIGURE 15

Figure 15 — At normal engine speeds the bleed valve in the distributor stays open and bleeds off the vacuum applied to the governor diaphragm, therefore, no governor action takes place. At higher engine speeds (approximately 3800 - 4000 engine RPM) where governing is needed, the centrifugal weight in the distributor closes the bleed valve and vacuum is applied directly to the governor diaphragm. The diaphragm pulls the throttle valves closed against the governor spring tension to a position where the engine will not exceed the governed engine speed.

When power is required, as engine load is increased the engine manifold vacuum will drop and allow the governor spring to open the throttle valve farther to increase engine speed.

The secondary throttle valves are operated by a link connecting the primary governor lever to a lever and collar assembly in the secondary throttle shaft. The lever and collar assembly rotates on the secondary throttle shaft and picks up the stationary lever fixed to the secondary throttle valve shaft. The secondary throttle valves do not begin to open until

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after a certain degree of primary throttle valve opening as explained in the power system operation.

The secondary throttle valves are held closed by a torsion spring located on the secondary throttle shaft. A closing tang on the lever and collar assembly gives a partial closing of the secondary valves in case of breakage of the secondary closing spring.

The basic systems and operation are the same as on the standard Model 4G and 4GC carburetors, as explained in the previous text.

MAJOR SERVICE OPERATIONS

DISASSEMBLY, CLEANING, INSPECTION AND ASSEMBLY PROCEDURES

The following disassembly and assembly procedures may vary somewhat between applications due to specific design features. However, the following will basically pertain to all Model 4G and 4GC's.

Air Horn Disassembly (Fig. 16 & 17)

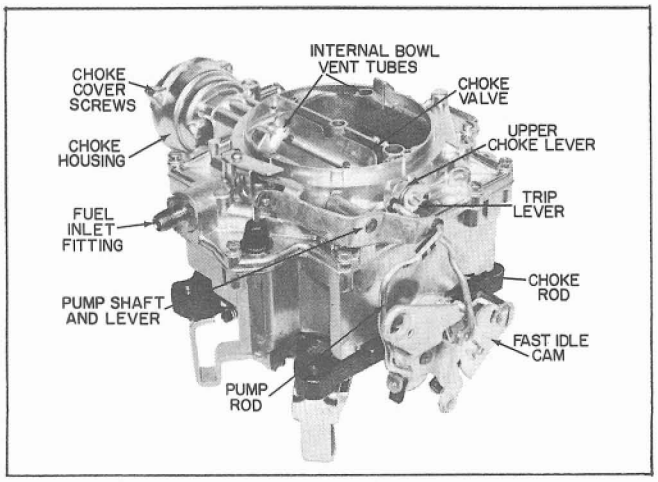

FIGURE 16

1. Mount carburetor on holding fixture.
2. Remove the fuel inlet fitting and gasket. (Remove the filter, filter spring and gasket, where used).

   NOTE: Omit steps 3, 4, 7, 8, 9 if choke housing is mounted on float bowl or throttle body. If choke housing is mounted on float bowl or throttle body remove clips from the intermediate choke rod and remove rod from upper choke lever and intermediate choke lever on choke housing.
3. Remove choke cover and gasket by removing three choke cover retaining screws and retainers.
4. Remove baffle plate inside choke housing.
5. Remove choke trip lever retaining screw at opposite end of choke shaft, then remove trip lever.
6. Remove fast idle cam attaching screw, then remove the fast idle cam, choke rod and upper choke lever, as an assembly. If disassembled further note position of parts for ease in reassembly.
7. File staking off two choke valve attaching screws, then remove screws and choke valve from choke shaft.
8. Rotate choke shaft to free choke piston from choke housing bore, then remove choke piston and shaft and lever assembly from air horn.
9. Remove two choke housing attaching screws, then remove choke housing and gasket from air horn.
10. Remove retaining clips from pump rod and remove rod from pump lever and throttle lever.
11. Remove the clip retainer from the pump plunger shaft. Remove pump lever shaft retaining clip, then slide pump shaft and lever assembly out of air horn casting.
12. Remove the 13 air horn attaching screws, including the one screw recessed in the top of the air horn.
13. Carefully lift the air horn straight up until the float assemblies are clear of the carburetor body, lay air horn inverted, on clean bench.

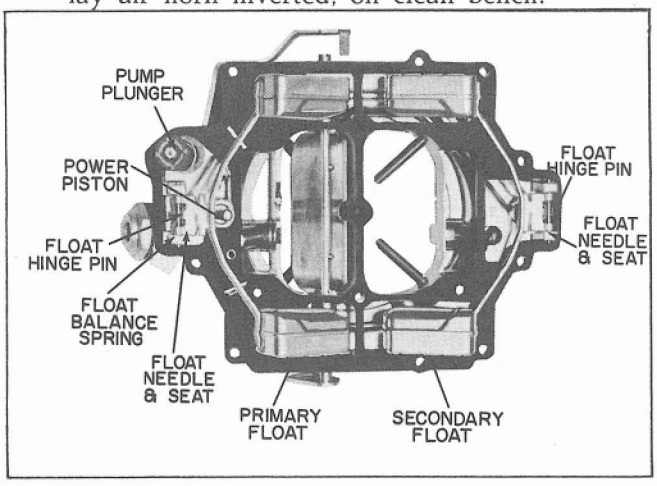

FIGURE 17

14. Remove the hinge pin from the primary float assembly, then slide the float and needle away from the power piston stem. (Mark primary floats with a "P".)
15. Remove primary float needle seat and gasket, using Tool BT 3006.

    NOTE: The float needles and seats are factory matched and must be installed in pairs. Needle and seat orifice size may differ between the primary and secondary side.
16. Remove the hinge pin, float assembly, needle seat and gasket from the secondary side of the air horn. *Do not* remove the float *balance spring* unless it is distorted and needs replacement.
17. Remove the air horn gasket.
18. Remove the power piston and spring assembly by depressing the stem and allowing it to snap back into position.
19. Remove the pump plunger assembly by sliding the shaft through the rubber pump shaft seal. Remove the rubber seal from the top side of the air horn casting.

20. Remove the idle vent valve and guard from top of air horn before putting the air horn in cleaning solvent.

Disassembly of Carburetor Float Bowl (Fig. 18)

NOTE: Omit steps (1) through (5) if choke housing is mounted on air horn or throttle body.

1. Remove the three choke cover attaching screws and retainers, then remove the choke cover and gasket.
2. Carefully lift the baffle plate from the choke housing.
3. Remove the choke piston lever attaching screw, then remove the lever, link and piston assembly from the choke housing.
4. Remove the two choke housing attaching screws, then remove the choke housing from the carburetor bowl.

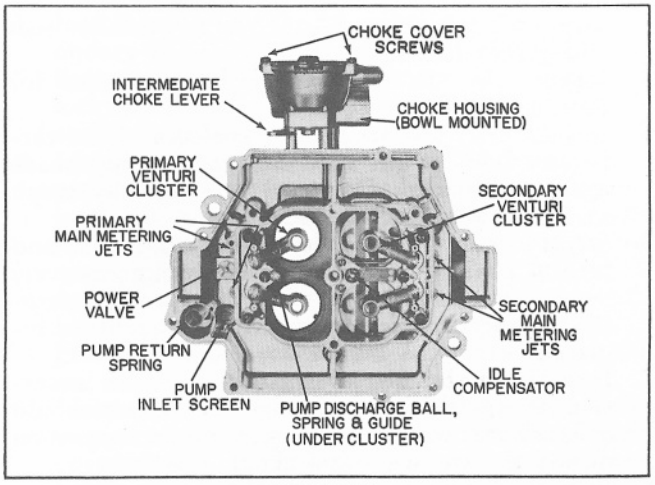

FIGURE 18

5. Remove the intermediate choke shaft and lever assembly from the choke housing, then remove choke housing gasket.
6. Remove the three attaching screws and lock washers from the venturi cluster on the primary side, then carefully remove the cluster and gasket.

   NOTE: Some models use main well inserts, or baffles in the primary main wells. Observe position for ease in assembly.
7. Remove the three attaching screws and lock washers from the venturi cluster on the secondary side, then carefully remove the cluster and gasket.
8. (If used): Remove idle compensator valve and gasket between secondary venturi by removing (2) attaching screws.
9. Remove both metering jets from the primary (pump) side of the carburetor body.
10. Remove the power valve and gasket.
11. Remove both metering jets from the secondary side of the carburetor. Keep them in a separate group.
12. Remove the pump return spring from the pump well, then invert the carburetor body to remove the *aluminum* pump inlet ball from the well (where used).
13. Remove the small "T" shaped pump discharge spring guide, then remove the small spring and *steel* ball.
14. If it is necessary to clean or replace the small screen next to the pump plunger bore, remove the retainer ring and screen.
15. Invert the carburetor body and remove the four throttle body attaching screws. Remove throttle body and gasket from float bowl.
16. Remove the secondary auxiliary throttle valve assembly from carburetor float bowl (if used).

    NOTE: The auxiliary throttle valve assembly should not be disassembled as the closing spring is specifically calibrated for the particular engine on which it is used. Make sure valves close freely after cleaning.

Disassembly of the Throttle Body (Fig. 19)

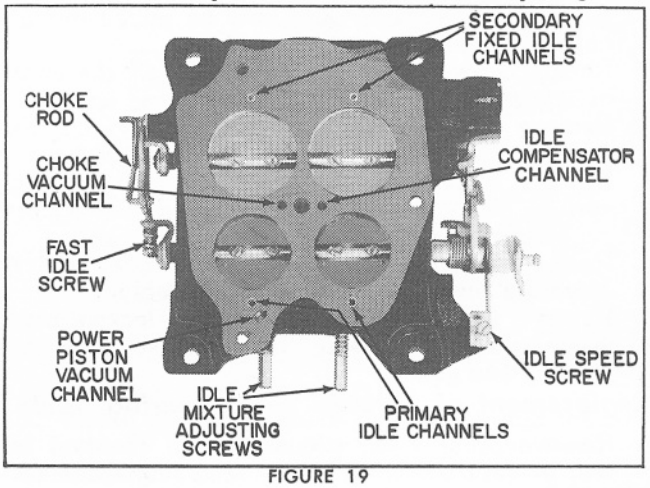

FIGURE 19

No attempt should be made to remove the throttle valves or shafts from the throttle body as it may be impossible to reassemble the throttle valves correctly in relation to the vacuum advance and idle discharge orifices.

The idle mixture needle screws may be removed for cleaning or replacement. Also the slow and fast idle speed screws and springs can be removed and replaced if necessary.

NOTE: If the choke is mounted on the throttle body, use steps (1) through (5) under float bowl disassembly.

Disassembly of 4G Governor (Fig. 20)

1. Remove throttle lever and bearing assembly by removing (4) attaching screws and lockwashers. Then pull outward on lever assembly and remove gasket.
2. Remove governor housing side plate by breaking wire seal and removing (4) attaching screws.
3. To remove governor diaphragm, remove (10) diaphragm cover attaching screws, then remove

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Disassembly of 4G Governor (Cont.)

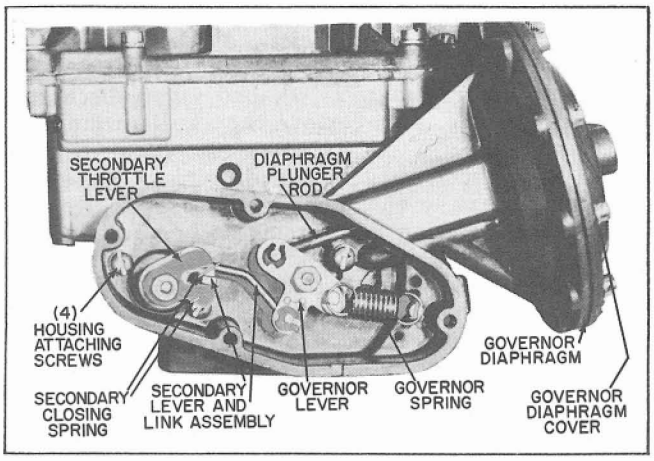

FIGURE 20

diaphragm cover.

4. Disconnect diaphragm plunger rod from governor lever by removing clip on end of plunger rod. Governor diaphragm may now be pulled out of governor housing.
5. Remove governor spring by sliding off the ends of stationery pin and pin on governor lever.
6. Remove (2) 11/32" nuts and lockwashers on ends of primary and secondary throttle shafts.
7. Remove secondary throttle lever and closing spring. *Note position of secondary closing spring for ease in reassembly.*
8. Remove governor lever, link and secondary valve actuating lever as a complete assembly.
9. Remove (4) attaching screws and lockwashers inside governor housing, then remove governor housing and gasket.

Replacement of Throttle Shaft Bearing Seals

1. Remove primary throttle shaft seal (located in rear of governor housing) by removing seal staking; then pry seal from housing.
2. Remove 3/4" welch plug from end of secondary throttle shaft (throttle lever side).
3. Remove (4) secondary throttle valve screws. *Mark throttle valves to insure correct location when re-installing.*
4. Hold valves vertical and slide secondary throttle valves from throttle shaft.
5. Using a soft punch lightly tap end of secondary shaft (throttle lever side). Bearing and shaft seal will then slide out of throttle body (governor side).
6. Remove seal and spring washer from secondary shaft.

No further disassembly of the throttle body is recommended as the other throttle shaft bearings are staked in place and removal may distort the ball bearings and disrupt throttle shaft and valve alignment.

Cleaning of Parts

The carburetor should not be cleaned in any solution other than a cold immersion type cleaner.

1. Thoroughly clean carburetor castings and metal parts in carburetor cleaning solvent.
   CAUTION: Any rubber or plastic parts, diaphragms, leather seals and pump plunger should not be immersed in solvent. Clean with stoddard solvent only (or equivalent).
2. Blow all passages in casting dry with compressed air. DO NOT PASS DRILLS THROUGH JETS OR PASSAGES.
3. The 4G governor throttle body ball bearings can be cleaned in cold immersion type cleaner without disassembling the throttle valves, if all bearing seals are removed. Make sure ball bearings are lubricated with light motor oil (SAE 10); before reassembly.

Inspection of Parts

1. Check floats for dents or excessive wear at hinge pin holes.
2. Shake floats to check for leaks.
3. Examine float needle and seat. Replace if necessary with a factory matched float needle, seat and gasket assembly.
4. Inspect the idle mixture adjusting needles for burrs or ridges.
5. Inspect the upper and lower surfaces of the carburetor body to see that the small sealing beads are not damaged. Damaged beading may result in air or fuel leaks at that point.
6. Inspect holes in pump lever, fast idle cam, and throttle shaft lever. If holes are worn excessively or out of round to the extent of improper operation of the carburetor, worn parts should be replaced.
7. Inspect the steps on the fast idle cam for excessive wear. If excessive wear is noted, it should be replaced to assure proper engine operation during the warm-up and choking periods.
8. Inspect the pump plunger. If the pump plunger is damaged, replace.
9. Inspect the throttle flange assembly. Make sure the idle passages and vacuum channels are clean.
10. Inspect governor diaphragm for cracks or leaks.
11. Inspect throttle shaft bearing seals for wear. Replace with new seals if removed or worn.
12. Check throttle valve screws for tightness. If loose, tighten screws and stake properly.

CARBURETOR ASSEMBLY

ASSEMBLY OF 4G GOVERNOR THROTTLE BODY

Installation of Throttle Shaft Bearing Seals

1. Install spring washer and bearing seal over governor end of secondary shaft next to ball bearing. Chamfered end of seal faces bearing and spring washer. Lubricate seal with light motor oil (SAE 10).
2. Install secondary throttle shaft in throttle body, press seal in flush with casting face.
3. Install secondary throttle valves into slots in secondary shaft as marked under disassembly;

then install throttle valve screws. Before tightening screws, align throttle valves so that they seal tightly in throttle bores. Push secondary shaft inward until it is seated against bearing on throttle lever side. Tighten throttle valve screws and stake securely.

4. Install new ¾" welch plug in hole over secondary throttle shaft bearing. (Throttle lever side). Press tightly in place.
5. Install primary throttle shaft bearing seal in rear of governor housing. (Chamfer on seal faces shaft bearing.) Stake seal in place.

Completion of 4G Governor Assembly

1. Install new gasket on governor housing, then install governor housing on throttle body using (4) attaching screws and lockwashers. Tighten securely.
2. Install governor lever, link and secondary valve actuating lever as shown (Fig. 20). Make sure "D" hole in primary lever is seated on flat of primary throttle shaft.
3. Install secondary throttle closing spring and secondary throttle lever on throttle shaft. Make sure flats on lever are seated on shaft. Install (2) lockwashers and 11/32" nuts on ends of throttle shafts to retain levers. Tighten securely.
4. Install ends of governor spring over stationery pin and pin on governor lever. Make sure spring is seated in grooves on pins and ends of spring loops point downward. Use a light grease on spring pins to prevent friction and breakage.
5. Install governor diaphragm rod into governor housing and then end of rod into governor lever. End of plunger rod should face outward. Install rod retaining clip and pinch ends together.
6. Line up holes in governor diaphragm with holes in governor diaphragm housing. Install diaphragm cover and ten retaining screws and lockwashers. Leave screws loose so that diaphragm can move freely between cover and housing.
7. To obtain the proper convolute in the governor diaphragm open the primary throttle valves wide open. Then tighten governor diaphragm cover screws securely. If the diaphragm is not installed as described, it may be too taut and will prevent full throttle opening.
8. Install governor housing side plate using (4) attaching screws and lockwashers. Tighten screws securely.
9. Install throttle lever and bearing assembly using new gasket. Install (4) attaching screws and lockwashers. Tighten securely.

Assembly of the Throttle Body — All Models

As mentioned during the disassembly of the carburetor, there is a very close tolerance fit of the throttle valves in the throttle body. Also the idle discharge orifices are drilled in relation to a properly fitting valve. Therefore, if the throttle valves, levers or shafts are worn excessively or damaged, a complete throttle body assembly is required.

1. Install the idle mixture needles and springs finger tight. Back out the needles 1½ turns as a preliminary idle adjustment.
2. If removed, install the slow and fast idle screws in the throttle levers.

NOTE: If choke coil and housing are mounted on the throttle body, the installation is covered under *final carburetor assembly*.

Assembly of the Carburetor Float Bowl (Fig. 21)

1. With the float bowl inverted, install the auxiliary throttle valve assembly (if used).
2. Position the throttle body gasket on the float bowl so that all holes are properly aligned.
3. Place the throttle body on the float bowl and install the four attaching screws. Tighten the ⅜" — 24 center screw 9 to 10 ft. lbs. and the 12-28 outer screws 3 to 4 ft. lbs.
4. Place the throttle body and bowl upright on the carburetor stand.

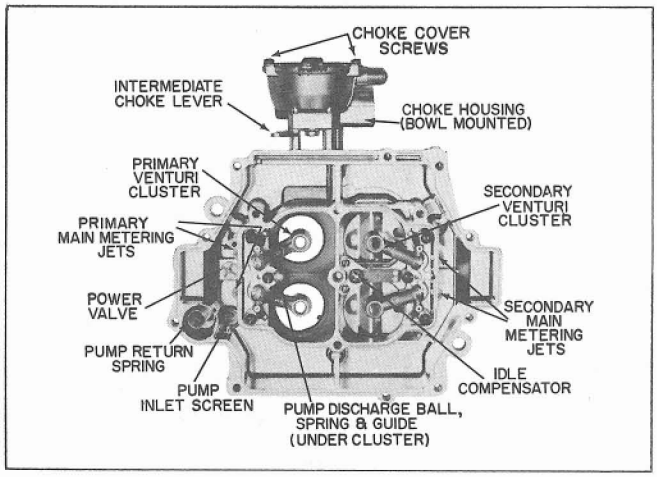

FIGURE 21

5. Install the power valve and gasket, and the two primary main metering jets into float bowl.
6. Install the two secondary main metering jets.
7. Install the secondary venturi cluster and gasket and retain with three attaching screws and washers. Tighten securely.

   NOTE: The secondary cluster does not have pump discharge nozzles.
8. Install the pump outlet *steel* ball, spring, and "T" shaped retainer in the center hole of primary venturi cluster mounting surface in carburetor body. "T" retainer must be flush with casting.
9. Install primary venturi cluster and gasket and retain with three attaching screws and lock washers. Tighten securely.

   NOTE: Primary main well insert tubes or baffles are used in the main wells on some models. Make sure insert tubes are installed in recess provided, with flats on lip of tubes lined up with flats in casting recess. If baffles are used, they should face towards carburetor bores when cluster is installed.

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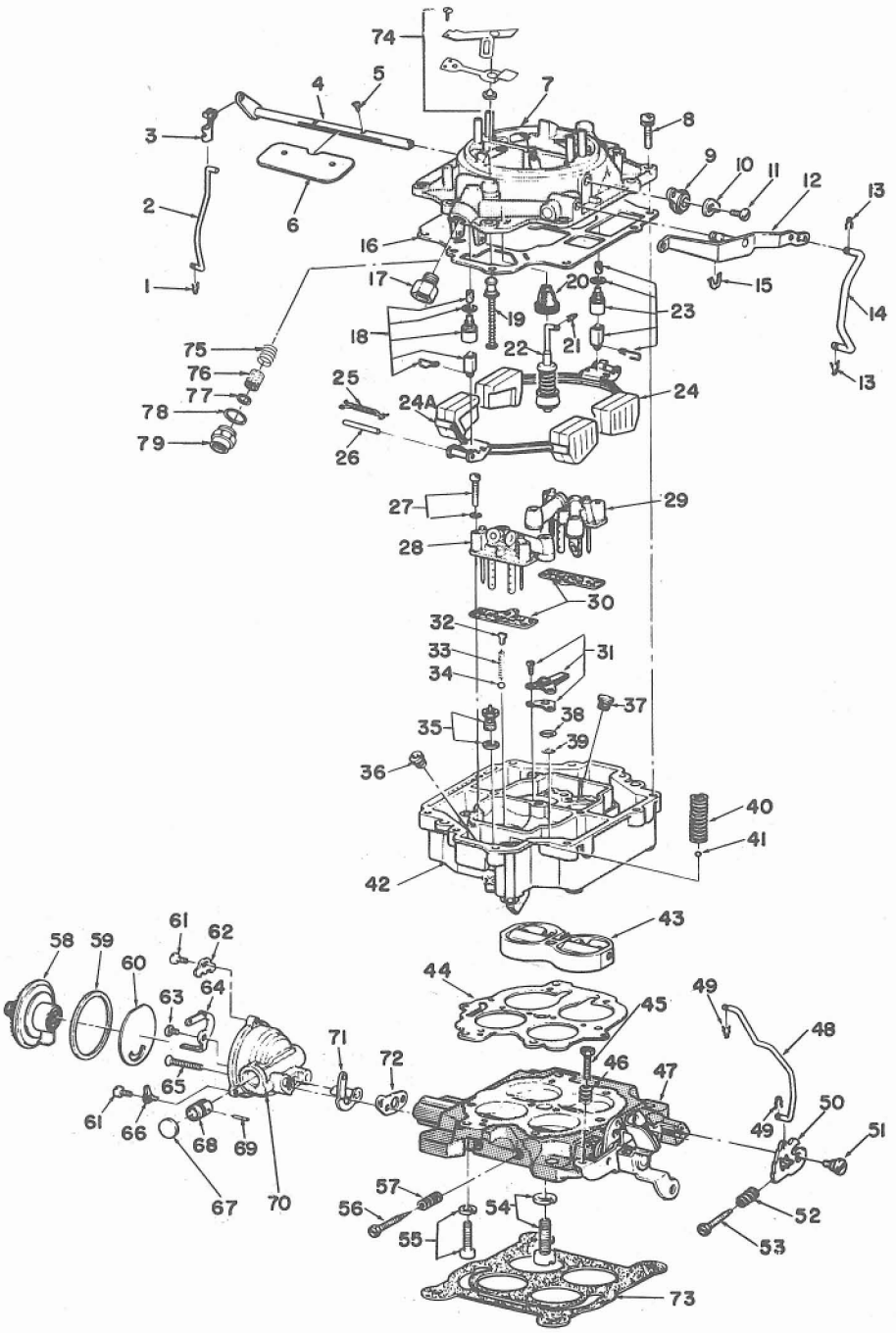
TYPICAL EXPLODED VIEW — MODELS 4G, 4GC



1. Clip—Intermediate Choke Rod (lower)
2. Intermediate Choke Rod
3. Clip—Intermediate Choke Rod (upper)
4. Choke Shaft and Lever Assembly
5. Screw—Choke Valve
6. Choke Valve
7. Air Horn Assembly
8. Screw—Air Horn
9. Choke Lever and Collar Assembly
10. Choke Trip Lever
11. Screw—Choke Trip Lever
12. Pump Shaft and Lever Assembly
13. Clip—Pump Rod
14. Pump Rod
15. Clip—Pump Shaft and Lever
16. Gasket—Air Horn
17. Fuel Inlet Fitting
18. Needle and Seat Assembly (primary)
19. Power Piston Assembly
20. Boot—Pump Plunger
21. Clip—Pump Plunger
22. Pump Plunger Assembly
23. Needle and Seat Assembly (secondary)
24. & 24A. Float Assembly
25. Float Balance Spring and Clip Assy.
26. Float Hinge Pin
27. Venturi Cluster Screw and Lockwasher
28. Venturi Cluster (primary)
29. Venturi Cluster (secondary)
30. Gaskets—Venturi Cluster
31. Idle Compensator Assembly
32. Guide—Pump Discharge
33. Spring—Pump Discharge
34. Check Ball—Pump Discharge
35. Power Valve Assembly
36. Main Metering Jet (primary)
37. Main Metering Jet (secondary)
38. Pump Inlet Screen Retainer
39. Pump Inlet Screen
40. Spring—Pump Return
41. Check Ball—Pump Inlet
42. Float Bowl Assembly
43. Auxiliary Throttle Valve Assembly
44. Gasket—Throttle Body to Bowl
45. Screw—Idle Speed
46. Spring—Idle Speed Screw
47. Throttle Body Assembly
48. Choke Rod
49. Clips—Choke Rod Attaching
50. Fast Idle Cam
51. Screw—Fast Idle Cam
52. Spring—Fast Idle Screw
53. Fast Idle Screw
54. Screw—Throttle Body to Bowl (large)
55. Screw—Throttle Body to Bowl (small)
56. Idle Mixture Screw
57. Spring—Idle Mixture Screw
58. Choke Cover and Coil Assembly
59. Gasket—Choke Cover and Coil
60. Choke Baffle Plate
61. Screws—Choke Cover Attaching
62. Retainers—Choke Cover (toothed)
63. Screw—Choke Piston Lever
64. Choke Piston Lever and Link Assembly
65. Screw—Choke Housing Attaching
66. Retainer—Choke Cover
67. Plug—Choke Housing
68. Choke Piston
69. Pin—Choke Piston
70. Choke Housing Assembly
71. Intermediate Choke Shaft and Lever
72. Gasket—Choke Housing
73. Gasket—Carburetor to Manifold
74. Idle Vent Valve Assembly
75. Spring—Filter Element Relief
76. Filter Element
77. Gasket—Filter Element
78. Gasket—Fuel Inlet Fitting
79. Fuel Inlet Fitting

10. Install the pump inlet *aluminum* ball (where used) and the pump return spring in the pump plunger well. Be sure the spring is seated over the ball.
11. Install the pump inlet screen and retainer if removed (where used).

Assembly of the Air Horn (Fig. 22)

1. Install the power piston spring in the power piston bore (vacuum assist float only), then install the power piston in the air horn and stake the casting lightly to hold the piston in place. (All).
2. Install the pump plunger rubber boot in the air horn by inserting the small end through from the bottom. The lips of the seal must be seated on both sides of the cover.

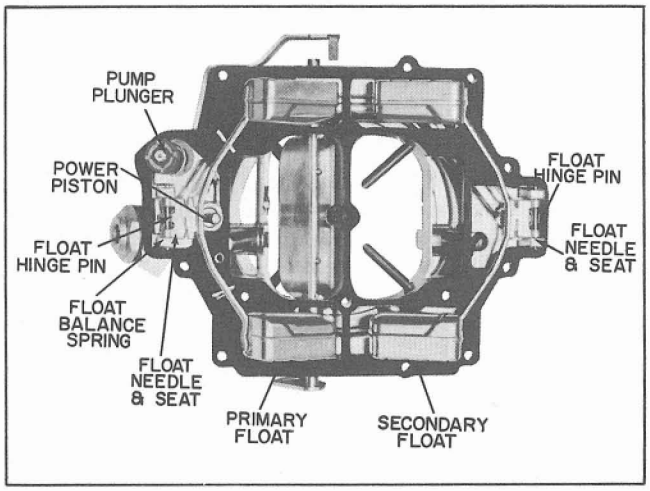


FIGURE 22

3. Install the pump lever on air horn. Install retaining clip. Insert pump plunger shaft through rubber seal and attach to pump lever, using retaining clip. End of pump plunger shaft points outward.
4. Position the gasket on the air horn.
5. Install both primary and secondary float needle seats and gaskets, using Tool BT 3006. Do not mix primary and secondary needle and seats.
6. Install secondary float assembly on the air horn, retaining in place with hinge pin.
7. Install primary float assembly on the air horn, retaining in place with hinge pin.

   NOTE: Make sure tang on rear of float arm is located on top of float balance spring, for proper operation of float assemblies.

8. *Make necessary float adjustments as outlined in specifications and adjustment section of parts and service manual.*

Final Carburetor Assembly (Fig. 23)

1. Carefully guide the air horn assembly on the carburetor body so that the pump plunger, and power valve stem and float will not be damaged.
2. Align the holes in the air horn, gasket and body and just start the 13 air horn attaching screws.
3. Tighten evenly and securely the (3) inner attaching screws closest to the center of the air horn. Then tighten the (10) remaining outside attaching screws in the same manner.
4. Install new gasket on choke housing, then choke housing to air horn retaining with two screws. Tighten securely.
5. Install choke piston on choke shaft and lever assembly retaining in place with piston pin.
6. Slide choke shaft and piston assembly into choke shaft hole in air horn and rotate shaft to insert choke piston into choke piston bore in choke housing.
7. Slide the choke valve through the shaft so that the letters "RP" on the valve are facing up when the valve is closed.
8. Just start the two small choke valve attaching screws. Do not tighten.
9. If carburetor has idle vent valve, install the rubber idle vent valve and guard, on top of the air horn.

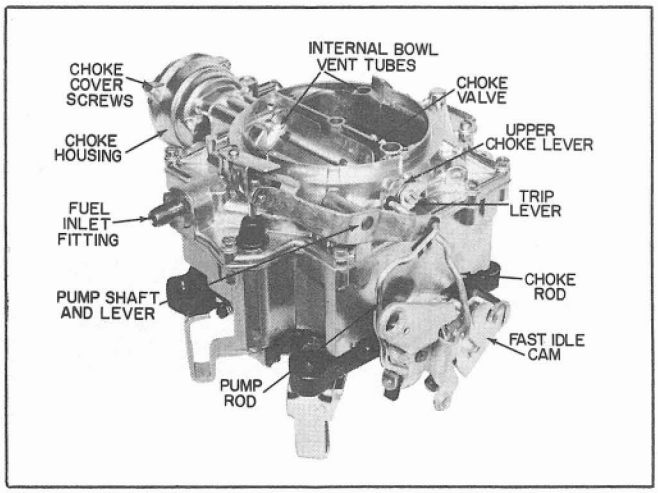


FIGURE 23

10. Install the choke rod, upper choke lever, and fast idle cam, then install the fast idle cam attaching screw. Tighten securely.
11. Position the choke trip lever over the end of the choke shaft. Be sure the tang on the trip lever is above the choke lever tang. Install and tighten the attaching screw.
12. To provide the correct fit of the choke valve in the air horn, push slightly on the end of the choke shaft to obtain a minimum clearance of .020 between the trip lever and upper choke lever.
13. While holding the choke shaft in this position, tighten the choke valve retaining screws. Check for free operation of the choke valve in the air horn. Stake choke valve screws securely.
14. Insert the end of the pump rod into the hole in the throttle lever, and then install retaining clip.
15. Install the upper end of the pump rod on the

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pump lever, retaining with clip provided.

16. Place the baffle plate in position in the choke housing.
17. Install the choke cover gasket, choke cover and coil assembly, and three screws and retainers.
18. Adjust automatic choke to specifications outlined in adjustment section of parts and service manual.
19. Install the fuel inlet filter and relief spring, gasket between inlet nut and the filter, the inlet nut gasket and the inlet nut. (On units equipped with fuel inlet filter).

NOTE: Refer to adjustment and specification section of parts and service manual for pump rod, idle vent and choke adjustments.

Assembly of Choke, Mounted On Float Bowl or Throttle Body (Fig. 24)

1. Install the choke housing gasket and the intermediate choke shaft and lever assembly in the choke housing.

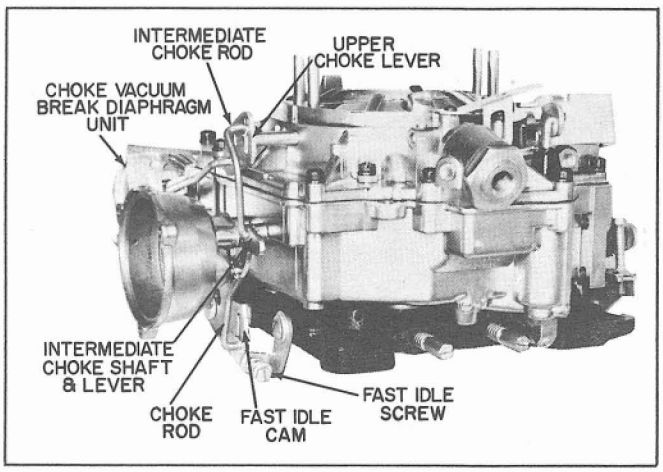

FIGURE 24

2. Install the choke housing on the carburetor bowl or throttle body and retain with two attaching screws. Be sure the intermediate choke shaft lever is extending downward between the two attaching screw bosses.
3. Install the choke lever, link, and piston assembly and attach the lever to the intermediate choke shaft.
4. Rotate the intermediate choke shaft to check for free movement of the shaft and piston.
5. Install the intermediate choke rod and retain with clips.
6. Adjust intermediate choke rod as outlined in specifications and adjustment section of parts and service manual.
7. Install baffle plate into choke housing and choke gasket, cover and coil assembly as outlined under steps 16, 17, 18. (Final Carburetor Assembly).

Carburetors Equipped with Split Choke Linkage

1. Install the choke housing gasket, intermediate choke lever and shaft in the choke housing.
2. Install the choke housing on the float bowl and retain with two attaching screws. Be sure the intermediate choke shaft lever is extending downward between the two attaching screw bosses.
3. Install the choke lever, link and piston assembly and attach lever to the intermediate choke shaft.
4. Install fast idle cam with attaching screw. Tighten securely.
5. Install the choke rod into the intermediate choke lever and fast idle cam. Retain with clips.
6. Install the intermediate choke rod to upper choke lever and intermediate choke lever, retain with clips.

NOTE: Refer to adjustment and specification section of parts and service manual for pump rod, idle vent and choke adjustments.